Koch, Kristine

From: GAINER Tom <GAINER.Tom@deq.state.or.us>
Sent: Wednesday, March 25, 2015 10:48 AM
To: Koch, Kristine
Cc: MCCLINCY Matt; GAINER Tom; poulsen.mike@deq.state.or.us; PETERSON Jenn L; PARRETT Kevin; JOHNSON Keith
Subject: Section 2 FS Review Comments
Attachments: Eco Screening Values for TPH Fractions.xls

Kristine-
Below are DEQ's comments on Section 2 of the 2/23/2015 Portland Harbor draft FS. DEQ sent EPA comments on the previous version of Section 2 on 9/4/2014 and responses were provided; DEQ is not repeating previously submitted comments. Please contact myself or Matt McClincy if you have questions.

Thanks-

Tom Gainer, P.E.
Project Manager/Environmental Engineer
Oregon Department of Environmental Quality, NW Region
503-229-5326

This spring, DEQ's Northwest Region Office will be moving to a new location - the 700 Lloyd Building at 700 NE Multnomah St., Suite #600, Portland, OR 97232. The target date for operating at the new location is May 26th, 2015.

Section 2.2, RAO 8 Suggest striking MCLs from this RAO as they are not relevant to ecological receptors.

Section 2.2.1

1. Identification of Contaminants of Concern, Weak Lines of Evidence: It is unclear how COCs were eliminated based on representing a weak line of evidence, and how they are tied to COCs in the BERA . It is unclear if the designation of a weak line was for one or all media in which it was identified. For example, diesel range hydrocarbons were identified in both sediment predictive models (LRM) and transition zone water. Additionally, it is unclear if spatial scale of exceedance harbor wide was a consideration in defining those as weak lines of evidence. While some COCs are found primarily in one area (e.g. trimethylbenzenes, off GASCO) it is unclear if this results in their designation as weak lines. A better way to state it would be that they are strong and appropriate lines for a given river mile (source) within the larger Site. This is also a more comprehensive way to connect upland source exceedances in groundwater with pore water exceedances in sediment. A table that lists those lines of evidence designated as weak, along with the reasoning, would be a better way to review this section.

2. Co-location with other contaminants: DEQ suggests that EPA name all contaminants as COCs, including those co-located with other contaminants, and then indicate that focusing on co-located COCs may achieve protectiveness. Dropping contaminants as COCs may hinder the ability to ensure that contaminants are adequately evaluated.

3. Related Contaminants Addressed by Other Contaminants (and Appendix B2, Section 1.3): The text states that Total DDD, DDE and DDT were grouped for PRG development and the individual sums were eliminated. For ecological risk PRG tables, both DDX and DDE are listed. Please note that DDE is

the COC that came through the risk assessment for piscivorous birds, and that the DDX TRV may not be protective of DDE effects. Unlike the DDE TRV in the BERA, the ATLs calculated based on the individual and population-based TRVs for DDX of 0.227 and 2.27 mg/kg-day generally exceed concentrations considered protective of fish-eating birds. Due to the significant differences in the TRVs for the DDE and DDX, DEQ does not believe that DDE effects will be sufficiently represented by DDX and recommends that DDE be the primary PRG. Alternatively, a DDX TRV that better considers DDE effects could be used as a surrogate for transformation.

Table 2.1-4 This table identifies a number of values from DEQ Water Table 31 Aquatic Life Water Quality Guidance Values for Toxic Pollutants as DEQ Ambient Water Quality Criteria (acute and chronic). Values from Table 31 are not DEQ AWQC. Table 2.1-4 should be edited accordingly.

Table 2.2-1

1. We suggest adding headers (*e.g.*, Drinking Water/Direct Contact) under RAO 3 and RAO 4. In general, the PRGs for RAO 3 and RAO 4 are identical. Table 2.2-3 provides the basis for selection of the COCs for each RAO. In some cases, the basis for a COC is provided but there is no PRG (*e.g.*, PBDE for RAO 3), and in other cases there is a PRG, but no basis provided in Table 2.2-3 (*e.g.*, zinc PRG for RAO 3, aldrin and dieldrin for RAO 4).

2. A beach PRG for RAO 1 is not provided, although a basis is presented in Table 2.2-12.

3. Footnotes 16 and 17 are not included.

4. RAO 8, Manganese PRG: The chronic criteria of 120 ug/L to screen risks to aquatic organisms from exposure to dissolved manganese (Mn) is a tier II water quality benchmark, published in 1996 by Suter and Tsao (Suter GW, Tsao CL, 1996, Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 revision, Prepared for U.S. Department of Energy Office of Environmental Management, Risk Assessment Program, Health Sciences Research Division). In a November 25, 2014 technical memo addressed to EPA, Windward Environmental, on behalf of the LWG, proposed revising the Mn PRG based on a more robust set of toxicity tests than those used by Suter and Tsao and additional studies that demonstrate Mn toxicity is influenced by water hardness. Windward compiled bioassay results from published and unpublished studies and employed EPA protocols to derive acute and chronic SLVs for Mn based on hardness.

   DEQ Cleanup has been working on internal guidance for project managers on issues associated with Mn. This effort included a review of the Windward Environmental memo, as DEQ supports the development of a hardness-based SLV and would like to match the Portland Harbor Mn PRG with the Mn risk values identified by our work group. This DEQ review of the Windward memo concluded:

   A. Much of the data used by Windward to derive acute and chronic criteria does not appear to meet the guidelines for minimum data quality set out by Stephan (Stephan CE, Mount DI, Hansen DJ, Gentile JH, Chapman GA, Brungs WA, 1985, Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses, PB85-227049, Office of Research and Development, US Environmental Protection Agency, Washington, DC.) and followed by Suter and Tsao (1996). DEQ has questions regarding the following data quality issues:

      - Absence of information on test conditions
      - Use of non-native species
      - Accuracy of data transcription from the literature

B. Re-calculation of the CMC based only on those tests that meet EPA guidelines may result in a different value than those presented by Windward.

Recommendations:

a. Explicitly state the criteria used for including bioassay tests in the data compilation and confirm the studies included meet these criteria.

b. When testing protocols deviate from EPA guidelines, explain the mitigating factors or circumstances that warrant or justify inclusion of the data.

c. Eliminate exotic species from the calculations unless supporting justification is provided.

d. Identify all deviations from EPA protocols in calculating CMCs and justify the excursion.

e. Review hardness and contaminant concentration data for accuracy, and recalculate hardness-toxicity relationship.

f. Re-calculate FAVs and CMCs following the above corrections.

The following detail is provided to support the above conclusions and recommendations.

Windward compiled bioassay data drawn from studies of Mn toxicity conducted between 1960 and 2012. However, it appears much of the data presented in the tech memo does not meet the test guidelines or data quality objectives described in Stephen and utilized by other investigators such as Suter and Tsao (1996) in developing Tier II benchmarks. Deviations from Stephen (1985) and Suter and Tsao (1996) include:

- Guidelines regarding variation in acute values indicate " *If the acute values within a species or among species in a genus differ by a factor of 10 or more, the higher values were excluded, and those that are within the factor of 10 range were used to attain a more conservative estimate.*"

  In Table 1 of the Windward memo, this guideline was not followed for the following species: *Chironomus tentans, Daphnia magna, Oncorhynchus mykiss,* and *Pimephales promelas.*

- Stephan (1985) also indicates that only tests with essential information on basic test conditions and protocols be included in the calculations. Data included from several investigators, representing 33 of 82 individual tests presented in Table 1, did not report: 1) the type of exposure (static, renewal, or flow-through), 2) whether the contaminant of interest was sampled during the test, or 3) the duration of the test. The majority of these bioassays are attributed to ENSR (1990, 1992, 1994 and 1996).

- For several genera and species only one test result is reported. A partial list of these includes: *Aeolosoma sp*. (oligochete worm), *Agosia chrysogaster (longfin dace), Anodanta imbecillis (freshwater mussel), Aselius aquaticus (isopod), Bufo boreus (western toad), Colise fasciata (giant gourami), Crangonyx pseugracillis (amphipod), Dutephrynus melanostictus (Asian common toad), Lampsillius siliquoidea (fatmucket clam).*

  Inclusion of these species, most of which represent the adult stage of their lifecycle rather than the more sensitive embryonic or juvenile stages has an effect on the FCV. Although only the

lowest 4 GMAVs are included in the calculations, the number of species with GMAVs is a factor. These species represent the most tolerant of the organisms used in the calculations. The LC50s for several of these organisms are listed below along with their rank in tolerance. (1) *Crangonyx pseugracillis,* 694,000 ug/L*;* (2) *Colise fasciata*, 542,969 ug/L; (3) *Aselius aquaticus,* 330,000 ug/L; (4) *Bufo boreus,* 211,027 ug/L; (6) *Dutephrynus melanostictus,* 81,261 ug/L.

The use of these test results is questionable in the derivation of acute criteria due to the limited amount, quality, applicability, and/or age of the data. Studies included in the report date as early as 1960, and although available to previous researchers like Suter and Tsao (1996) were not used or referred to by them in deriving acute and chronic criteria. The authors of the Windward memo do not discuss the sources and quality of the data and what guidelines they used when deciding to include/exclude the results of a study.

- Test data from one of the EPA publications cited by Windward (EPA, 2010 Final Report on Acute and Chronic Toxicity of Nitrate, Nitrite, Boron, Manganese, Fluoride, Chloride and Sulfate to Several Animal Species. EPA 905-R-10-002. USEPA, Chicago, IL.). As reported in Table 92 of the document, the water hardness of the two test solutions that bracket the interpolated LC50 value for *Lampsilis silquoidea* were 150 ppm and 220 ppm, not the 90 ppm reported in Table 1 of the Windward memo. Similarly and from the same report, for the tests conducted on *Megalonaias nervosa,* the hardness was 112 ppm, not 90 ppm as indicated in the Windward memo. These errors lead to an overestimation of the mitigating effects of hardness on manganese toxicity. The additional studies cited by Windward were not reviewed to confirm accuracy of the data used in the Windward hardness evaluation, but DEQ recommends a quality assurance review for data compiled from literature.

- Stephan (1985) indicates organisms without reproducing populations in North America should not be used in the derivation of criteria. Windward included the giant gourami (*Colise fasciata) and* Asian common toad *Dutephrynus melanostictus,*), which are native to south east Asia, in the derivation of acute criteria. Although not flagged by Windward, Stephan (1985) indicates *Asellius aquaticus* is not native to North America.

- In calculating final acute values or FAVs, Stephan (1985) indicates "*if for a commercially or recreational important species the geometric mean of the acute values from flow-through tests in which the concentrations of test material were measured is lower than the calculated Final Acute Value, then that geometric mean should be used as the Final Acute Value instead of the calculated Final Acute Value*'.

  The coho salmon is a recreationally and commercially valuable species that had a SMAV that was lower than the FAV. Based on the Stephan's scheme for deriving criteria, the coho SMAV would be used instead of the FAV in calculating a CMC.

- It is not clear why two separate SMAVs and GMAVs were reported for the same species *Lymnaea stagnalis,* whereas the protocol described by Stephan would result a single SMAV and GMAV.

- There appears to be an error in table with respect to calculating the hardness adjusted LC50 for *Lampsilis silquoidea.* The adjusted value should be less than 43,300 ug/L, not greater than this value.

5. RAO 8, TPH PRG: EPA proposed a PRG of 2.6 ug/L for the petroleum hydrocarbon aliphatic $C_{10} - C_{12}$ fraction to protect aquatic organisms from narcosis effects. DEQ agrees with this PRG. During recent discussions with EPA, we discussed refinements to the method of calculating PRGs for petroleum hydrocarbons fractions, and how the fractions should be analyzed. Based on our subsequent evaluations, we offer the following comments on the TPH fraction PRGs. Table 1 shows our proposed modifications to EPA's development of screening levels for TPH fractions. The most important proposed revision is the listing of screening values for higher molecular weight aromatic fractions because of revised solubility limits.

   Equivalent Carbon Numbers

   The nomenclature of $C_{10} - C_{12}$ is ambiguous as to whether actual carbon numbers or equivalent carbon numbers are intended. The aliphatic and aromatic fractions in Table 1 are based on Oregon's definition. The basic petroleum fractions used in DEQ's 2003 Risk-Based Decision Making (RBDM) document were developed by the TPH Criteria Working Group (TPHCWG, 1997a). The carbon numbers used to designate the fractions are "equivalent carbon numbers", based on a compound's boiling point or elution time on a gas chromatograph. In addition to the TPHCWG and DEQ, Washington and Massachusetts use equivalent carbons (EC) numbers in their evaluations of TPH fractions. It appears Alaska also uses EC numbers. For example, their designation of $C_6 - C_{10}$ and $C_{10} - C_{25}$ fractions would be ambiguous with regard to which fraction compounds with ten carbon atoms belong if actual carbon numbers were intended. If C_{10} was intended to belong to the first fraction, the second fraction should be designated $C_{11} - C_{25}$ rather than $C_{10} - C_{25}$. To avoid confusion, we propose that equivalent carbon fractions be explicitly named according to TPHCWG convention, such as $EC_{>10} - EC_{12}$. We include this convention for the DEQ fractions in Table 1.

   Analytical Method

   A consultant on the Premier Edible Oils project asked which laboratory analytical method should be used for the petroleum hydrocarbon fractions. Given that the basis for the fractions is DEQ RBDM guidance, we recommend using the extractable petroleum hydrocarbon and volatile petroleum hydrocarbon methods presented in guidance. However, because of the low screening values for some of the fractions, these analytical methods need to be modified to meet lower method detection limits. DEQ's laboratory can provide those modifications.

   Maximum Water Solubility

   Maximum water solubilities were originally calculated using equations based on surrogate carbon numbers for the fractions. The TPHCWG evaluated three methods of estimating parameter values for TPH fractions. The methods were simple averaging of constituent properties in each fraction, composition-based averaging, and correlation to relative boiling point index. The three approaches gave similar results. We propose to use the values based on the TPHCWG's recommended approach, the correlation method.

   A comparison of original calculated and current proposed water solubilities in Table 1 shows that aromatic fraction solubilities were previously underestimated. As EPA states in your supporting material for the derivation of TPH fraction screening values, it is inappropriate to propose a screening value for narcosis effects if the screening value is greater than the maximum solubility. This is because the primary toxic effects will be due to the physical presence of a separate phase petroleum product rather than narcosis. For this reason, screening levels were not previously provided for aromatic fractions $EC_{>12} - EC_{16}$, $EC_{>16} - EC_{21}$, and $EC_{>21} - EC_{34}$. Using the proposed revisions, screening levels are now provided for these aromatic fractions. This is a substantial change.

   Molecular Weight

To convert from the molar basis of toxicity to a mass basis for screening levels, we need an estimate of the molecular weight for each fraction. We propose to use the recommended molecular weights from the TPHCWG study rather than the surrogate compounds originally proposed. This revision does not have a substantial effect on the calculated screening values.

Organic-Carbon Partition Coefficient, K_{oc}

For consistency with the other parameter values, we propose to use the recommended $\log K_{oc}$ values from the TPHCWG study rather than the values originally proposed. This revision does not have a substantial effect on the calculated screening values.

Chemical Constituents

For completeness and for consistency with DEQ's approach for calculating TPH risk-based concentrations, we added individual chemical constituents to Table 1. Calculations were performed the same as for chemical fractions. We note that calculated screening levels for individual constituents are typically much higher than screening values based on benthic toxicity.

Portland Harbor Example

The evaluation of petroleum hydrocarbon fractions in the BERA was performed using assumed percentages of aliphatic and aromatic fractions in TPH-gasoline, not measured fractions. To get a better understanding of the composition of hydrocarbons, including diesel, we evaluated measured fraction data from the February 2014 Groundwater Monitoring Report for the Arco/BP Terminal 22T bulk fuel facility in Portland Harbor. Data from both shallow and deep groundwater monitoring wells showed higher molecular weight aromatic fractions at concentrations greater than the new calculated SLVs shown in Table 1. Because the material is an LNAPL, the presence of TPH fractions in deep groundwater makes it more likely the concentrations are representative of dissolved phase hydrocarbons. There were also higher molecular weight aliphatic fractions at concentrations greater than SLVs, and in some cases greater than solubility limits.

Conclusion

To create a more consistent and defensible approach, we are suggesting modifications to EPA's approach for calculating screening levels for petroleum hydrocarbon fractions. The one modification that results in a substantive change to screening values is a correction to maximum solubility values for aromatic fractions. After making this revision, it is clear to us that it is important to have screening levels for higher molecular weight aromatic fractions to evaluate potential narcosis effects on aquatic organisms.

Tables 2.2-6 and 2.2-7 The RSLs for RAOs 3 and 4 do not appear to be from the current EPA table (January 2015). There are minor differences for most of the chemicals.

Appendix B-2, Ecological Risk Based PRG Derivation

Section 1.1, Benthic Invertebrate PRGs The text should specify that the L2 SQV values used were from a Logistic Regression Model using a pMax of 0.50.

Section 1.1, Benthic Risk Areas The text states that benthic risk areas were identified using numerical sediment PRGs (those listed in Table B-2), and empirical bioassay test results. However, since the benthic risk areas will not be available for review until Section 3, perhaps a placeholder statement could be added that states criteria used for this identification will be presented later. DEQ will withhold comments on the criteria for identification of these areas until Section 3 is available for review. DEQ recommends that the approach for defining these areas include specific details that describe how these

areas were identified based on multiple lines of evidence. The approach should include models (e.g., LRM, FPM or PEC Quotient) or appropriate combinations that most closely predict achievement of the toxicity test criteria listed as PRGs in this section. Although empirical tests results will be the strongest line of evidence and final PRG evaluated, the areas identified that may require bioassay testing is one objective of these criteria. For example, this may include use of complete LRM Level 2 model at a pMax of 0. 50 as presented in Table 6-11 in the BERA.

Section 1.2, Sediment PRGs based on Ingestion of Biota (Prey) Please include calculations related to the use of a weighted mean based on prey consumption portions.

Section 1.3, Sediment PRG for Piscivorous Bird Egg Unlike the DDE TRV in the BERA, the ATLs calculated based on the individual and population-based TRVs for DDX of 0.227 and 2.27 mg/kg-day generally exceed concentrations considered protective of fish-eating birds. Due to the significant differences in the TRVs for the DDE and DDX, DEQ does not believe that DDE effects will be sufficiently represented by DDX and recommends that DDE be the primary PRG. See also Comment #3 on Section 2.2.1.